

P^{CT} COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
US Department of Commerce
United States Patent and Trademark
Office, PCT
2011 South Clark Place Room
CP2/5C24
Arlington, VA 22202
ETATS-UNIS D'AMERIQUE
in its capacity as elected Office

Date of mailing (day/month/year) 15 January 2001 (15.01.01)	Applicant's or agent's file reference 991260 1PC
International application No. PCT/CN99/00061	Priority date (day/month/year)
International filing date (day/month/year) 26 April 1999 (26.04.99)	Applicant SHER, Tak, Chi

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
22 November 2000 (22.11.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer <p style="text-align: center;">Jean-Marc Vivet</p> Telephone No.: (41-22) 338.83.38
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The demand must be filed directly with the competent International Preliminary Examining Authority, or more Authorities are competent, with the one chosen by the applicant. The full name or two-letter code of that Authority may be indicated by the applicant on the line below:

IPEA/ _____

PCT

CHAPTER II

DEMAND

under Article 31 of the Patent Cooperation Treaty:

The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

For International Preliminary Examining Authority use only	
Identification of IPEA	Date of receipt of DEMAND
Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION	
Applicant's or agent's file reference 991260 1PC	
International application No. PCT/CN99/00061	International filing date (day/month/year) 26 April 1999 (26.04.99)
(Earliest) Priority date (day/month/year)	
Title of invention IMPROVED HAMMER FOR A PIEZOELECTRIC ACTUATOR AND METHOD FOR PRODUCING SAME	
Box No. II APPLICANT(S)	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)	
Polycity Enterprise Limited Flat D, 19th Floor, Wah Ha Industrial Building, 8 Shipyard Lane, Quarry Bay, Hong Kong, China	
Telephone No.:	
Facsimile No.:	
Teleprinter No.:	
State (that is, country) of nationality: CN	State (that is, country) of residence: CN
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)	
SHER, Tak Chi Flat D, 19th Floor, Wah Ha Industrial Building, 8 Shipyard Lane, Quarry Bay, Hong Kong, China	
State (that is, country) of nationality: CN	State (that is, country) of residence: CN
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)	
State (that is, country) of nationality:	State (that is, country) of residence:
<input type="checkbox"/> Further applicants are indicated on a continuation sheet.	

Box No. III AGENT OR COMMON REPRESENTATIVE: OR ADDRESS FOR CORRESPONDENCE

The following person is ☒ agent ☐ common representativeand ☒ has been appointed earlier and represents the applicant(s) also for international preliminary examination.☐ is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.☐ is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.Name and address: *(Family name followed by given name; for a legal entity, full official designation.
The address must include postal code and name of country.)*SHANGHAI PATENT & TRADEMARK LAW OFFICE
435 Guiping Road, Shanghai 200233, China

Telephone No.:

64853500

Facsimile No.:

64828651 ; 64828652

Teleprinter No.:

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION

Statement concerning amendments:*

1. The applicant wishes the international preliminary examination to start on the basis of:

☒ the international application as originally filed

the description

☐ as originally filed☐ as amended under Article 34

the claims

☐ as originally filed☐ as amended under Article 19 (together with any accompanying statement)☐ as amended under Article 34

the drawings

☐ as originally filed☐ as amended under Article 342. ☐ The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.3. ☐ The applicant wishes the start of the international preliminary examination to be postponed until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). *(This check-box may be marked only where the time limit under Article 19 has not yet expired.)*

* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

Language for the purposes of international preliminary examination:

☐ which is the language in which the international application was filed.☐ which is the language of a translation furnished for the purposes of international search.☒ which is the language of publication of the international application.☐ which is the language of the translation (to be) furnished for the purposes of international preliminary examination.

Box No. V ELECTION OF STATES

The applicant hereby elects all eligible States *(that is, all States which have been designated and which are bound by Chapter II of the PCT)*

excluding the following States which the applicant wishes not to elect:

Box No. VI CHECK LIST

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination:

For International Preliminary
Examining Authority use only

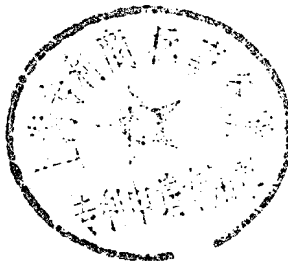
			received	not received
1. translation of international application	:	sheets	<input type="checkbox"/>	<input type="checkbox"/>
2. amendments under Article 34	:	sheets	<input type="checkbox"/>	<input type="checkbox"/>
3. copy (or, where required, translation) of amendments under Article 19	:	sheets	<input type="checkbox"/>	<input type="checkbox"/>
4. copy (or, where required, translation) of statement under Article 19	:	sheets	<input type="checkbox"/>	<input type="checkbox"/>
5. letter	:	sheets	<input type="checkbox"/>	<input type="checkbox"/>
6. other (specify)	:	sheets	<input type="checkbox"/>	<input type="checkbox"/>

The demand is also accompanied by the item(s) marked below:

- | | |
|---|--|
| 1. <input checked="" type="checkbox"/> fee calculation sheet | 4. <input type="checkbox"/> statement explaining lack of signature |
| 2. <input type="checkbox"/> separate signed power of attorney | 5. <input type="checkbox"/> nucleotide and or amino acid sequence listing in
computer readable form |
| 3. <input type="checkbox"/> copy of general power of attorney;
reference number, if any: | 6. <input type="checkbox"/> other (specify): |

Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).



For International Preliminary Examining Authority use only

1. Date of actual receipt of DEMAND:

2. Adjusted date of receipt of demand due
to CORRECTIONS under Rule 60.1(b):

3. ☐ The date of receipt of the demand is AFTER the expiration of 19 months
from the priority date and item 4 or 5, below, does not apply. ☐ The applicant has been
informed accordingly.

4. ☐ The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of
Rule 80.5.

5. ☐ Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival
is EXCUSED pursuant to Rule 82.

For International Bureau use only

Demand received from IPEA on:

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT (PCT Article 36 and Rule 70)

REC'D 24 JAN 2001
WIPO PCT

Applicant's or agent's file reference 991260IPC	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/CN 99/00061	International filing date (<i>day/month/year</i>) 26. Apr 1999(26.04.99)	Priority Date (<i>day/month/year</i>)
International Patent Classification (IPC) or national classification and IPC H01L 41/04		
Applicant Polycity Enterprise Limited et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXEX, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 22. Nov. 2000(22.11.00)	Date of completion of this report 29. December. 2000(29.12.00)
Name and mailing address of the IPEA/CN 6 Xitucheng Rd. Jimen Bridge, Haidian District, 100088 Beijing, China	Authorized officer <div style="text-align: center;">林张 ZHANG YONG LIN 印泉</div>
Facsimile No. 86-10-62019451	Telephone No. 62093722

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/CN 99/00061

1. Basis of the report

1. With regard to the **elements** of the international application: *

- ☒ the international application as originally filed.
- ☐ the description, pages _____, as originally filed,
pages _____, filed with the demand,
pages _____, filed with the letter of _____
- ☐ the claims, Nos. _____, as originally filed,
Nos. _____, as amended (together with any statement) under Article 19,
Nos. _____, filed with the demand,
Nos. _____, filed with the letter of _____
- ☐ the drawings, sheets/fig _____, as originally filed,
sheets/fig _____, filed with the demand,
sheets/fig _____, filed with the letter of _____

2. with regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of a publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3)

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

* * Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/CN 99/00061

V. Reasoned statement under article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement Novelty (N)	Claims	1 - 8	YES
	Claims		NO
Inventive step (IS)	Claims	1 - 8	YES
	Claims		NO
Industrial applicability (IA)	Claims	1 - 8	YES
	Claims		NO

2. Citations and explanations

concerning novelty: the claim 1 provides a new technical solution which is different from the solution provided by any document cited in the search report; therefore the subject matter of claim 1 is novel and meets the requirement of PCT Art. 33(2) concerning industry applicability the technical solution of the claim 1 provides the tool deposit arrangement for depositing various hand tools and is convenient for use. Therefore, the subject matter of claim 1. meets the requirement of PCT Art33(4). concerning inventive step: none of the documents cited in the search report shows any feature(s) of the characterizing portion of the claim 1, and would suggest alone or combination the technical solution of the claim 1. Therefore the claim 1 is considered to be involved an inventive step, and meet the requirement of PCT Art 33(3).

The dependent claims 2 - 6 are considered to meet the criteria set in PCT Art33(2)(3)(4).

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

To:

SHANGHAI PATENT & TRADEMARK
LAW OFFICE
435 Guiping Road Shanghai 200233 china

NOTIFICATION OF TRANSMITTAL OF
INTERNATIONAL PRELIMINARY
EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing
(day/month/year) 18 JAN 2001 (18.01.01)

Applicant's or agent's file reference
991260 IPC

IMPORTANT NOTIFICATION

International application No.
PCT/CN 99/00061

International filing date(day/month/year)
26. April 1999(26.04.99)

Priority date (day/month/year)

Applicant

Polycity Enterprise Limited et al

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.
4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/310).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/CN
6 Xitucheng Rd. Jimen Bridge, Haidian District, 100088
Beijing, China
Facsimile No. 86 - 10 - 62019451

Authorized officer

Zhang Yonglin

Telephone No. 62093722



PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 991260IPC	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/CN 99/00061	International filing date (<i>day/month/year</i>) 26. Apr 1999(26. 04. 99)	Priority Date (<i>day/month/year</i>)
International Patent Classification (IPC) or national classification and IPC H01L 41/04		
Applicant Polycity Enterprise Limited et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.


2. This REPORT consists of a total of 3 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXEX, i. e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 22. Nov. 2000(22. 11. 00)	Date of completion of this report 29. December. 2000(29. 12. 00)
Name and mailing address of the IPEA/CN 6 Xitucheng Rd. Jimen Bridge, Haidian District, 100088 Beijing, China	Authorized officer ZHANG 
Facsimile No. 86-10-62019451	Telephone No. 62093722

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/CN 99/00061

I. Basis of the report

1. With regard to the elements of the international application: *

- ☒ the international application as originally filed.
- ☐ the description, pages _____, as originally filed,
pages _____, filed with the demand,
pages _____, filed with the letter of _____
- ☐ the claims, Nos. _____, as originally filed,
Nos. _____, as amended (together with any statement) under Article 19,
Nos. _____, filed with the demand,
Nos. _____, filed with the letter of _____
- ☐ the drawings, sheets/fig _____, as originally filed,
sheets/fig _____, filed with the demand,
sheets/fig _____, filed with the letter of _____

2. with regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of a publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3)

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c))

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

* * Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/CN 99/00061

V. Reasoned statement under article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement				
Novelty (N)	Claims	1-8		YES
	Claims			NO
Inventive step (IS)	Claims	1-8		YES
	Claims			NO
Industrial applicability (IA)	Claims	1-8		YES
	Claims			NO

2. Citations and explanations

concerning novelty: the claim 1 provides a new technical solution which is different from the solution provided by any document cited in the search report; therefore the subject matter of claim 1 is novel and meets the requirement of PCT Art. 33(2) concerning industry applicability the technical solution of the claim 1 provides the tool-deposit arrangement for depositing various hand tools and is convenient for use. Therefore, the subject matter of claim 1. meets the requirement of PCT Art33(4). concerning inventive step: none of the documents cited in the search report shows any feature(s) of the characterizing portion of the claim1, and would suggest alone or combination the technical solution of the claim 1. Therefore the claim 1 is considered to be involved an inventive step, and meet the requirement of PCT Art 33(3).

The dependent claims 2 - 6 are considered to meet the criteria set in PCT Art33(2)(3)(4).

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

09/830116

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference

(if desired) (12 characters maximum) 991260 1PCWO

Box No. I TITLE OF INVENTION

IMPROVED HAMMER FOR A PIEZOELECTRIC ACTUATOR AND METHOD FOR PRODUCING SAME

Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

Polycity Enterprise Limited
Flat D, 19th Floor, Wah Ha Industrial Building,
8 Shipyard Lane, Quarry Bay,
Hong Kong, China

☐ This person is also inventor.

Telephone No.

Facsimile No.

Teleprinter No.

State (that is, country) of nationality:

CN

State (that is, country) of residence:

CN

This person is applicant for the purposes of:

☐ all designated States

☒ all designated States except the United States of America

☐ the United States of America only

☐ the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

SHER, Tak Chi
Flat D, 19th Floor, Wah Ha Industrial Building,
8 Shipyard Lane, Quarry Bay,
Hong Kong, China

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only (If this check-box is marked, do not fill in below.)

State (that is, country) of nationality:

CN

State (that is, country) of residence:

CN

This person is applicant for the purposes of:

☐ all designated States

☐ all designated States except the United States of America

☒ the United States of America only

☐ the States indicated in the Supplemental Box

☐ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:

☒ agent

☐ common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

SHANGHAI PATENT & TRADEMARK LAW OFFICE
435 Guiping Road, Shanghai 200233, China

Telephone No.

64853500

Facsimile No.

64828651

64828652

Teleprinter No.

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes: at least one must be marked):

Regional Patent

- ☐ AP ARIPO Patent: GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SZ Swaziland, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☐ EA Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☐ EP European Patent: AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☐ OA OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

- | | |
|---|---|
| <input type="checkbox"/> AL Albania | <input type="checkbox"/> LS Lesotho |
| <input type="checkbox"/> AM Armenia | <input type="checkbox"/> LT Lithuania |
| <input checked="" type="checkbox"/> AT Austria | <input type="checkbox"/> LU Luxembourg |
| <input type="checkbox"/> AU Australia | <input type="checkbox"/> LV Latvia |
| <input type="checkbox"/> AZ Azerbaijan | <input type="checkbox"/> MD Republic of Moldova |
| <input type="checkbox"/> BA Bosnia and Herzegovina | <input type="checkbox"/> MG Madagascar |
| <input type="checkbox"/> BB Barbados | <input type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input type="checkbox"/> BG Bulgaria | |
| <input type="checkbox"/> BR Brazil | <input type="checkbox"/> MN Mongolia |
| <input type="checkbox"/> BY Belarus | <input type="checkbox"/> MW Malawi |
| <input type="checkbox"/> CA Canada | <input type="checkbox"/> MX Mexico |
| <input type="checkbox"/> CH and LI Switzerland and Liechtenstein | <input type="checkbox"/> NO Norway |
| <input checked="" type="checkbox"/> CN China | <input type="checkbox"/> NZ New Zealand |
| <input type="checkbox"/> CU Cuba | <input checked="" type="checkbox"/> PL Poland |
| <input type="checkbox"/> CZ Czech Republic | <input type="checkbox"/> PT Portugal |
| <input checked="" type="checkbox"/> DE Germany | <input type="checkbox"/> RO Romania |
| <input type="checkbox"/> DK Denmark | <input type="checkbox"/> RU Russian Federation |
| <input type="checkbox"/> EE Estonia | <input type="checkbox"/> SD Sudan |
| <input checked="" type="checkbox"/> ES Spain | <input type="checkbox"/> SE Sweden |
| <input type="checkbox"/> FI Finland | <input type="checkbox"/> SG Singapore |
| <input checked="" type="checkbox"/> GB United Kingdom | <input type="checkbox"/> SI Slovenia |
| <input type="checkbox"/> GD Grenada | <input type="checkbox"/> SK Slovakia |
| <input type="checkbox"/> GE Georgia | <input type="checkbox"/> SL Sierra Leone |
| <input type="checkbox"/> GH Ghana | <input type="checkbox"/> TJ Tajikistan |
| <input type="checkbox"/> GM Gambia | <input type="checkbox"/> TM Turkmenistan |
| <input type="checkbox"/> HR Croatia | <input type="checkbox"/> TR Turkey |
| <input type="checkbox"/> HU Hungary | <input type="checkbox"/> TT Trinidad and Tobago |
| <input type="checkbox"/> ID Indonesia | <input type="checkbox"/> UA Ukraine |
| <input type="checkbox"/> IL Israel | <input type="checkbox"/> UG Uganda |
| <input type="checkbox"/> IN India | <input checked="" type="checkbox"/> US United States of America |
| <input type="checkbox"/> IS Iceland | |
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Box No. VI PRIORITY CLAIM

☐ Further priority claims are indicated in the Supplemental Box.

Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
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Box No. VIII CHECK LIST: LANGUAGE OF FILING

This international application contains the following number of sheets:

request : 3
 description (excluding sequence listing part) : 4
 claims : 2
 abstract : 1
 drawings : 2
 sequence listing part of description : _____

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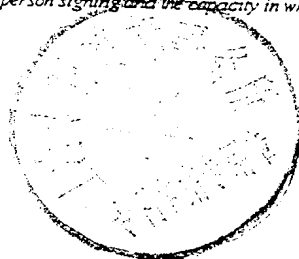
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5. ☐ priority document(s) identified in Box No. VI as item(s):
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Figure of the drawings which should accompany the abstract: 3A

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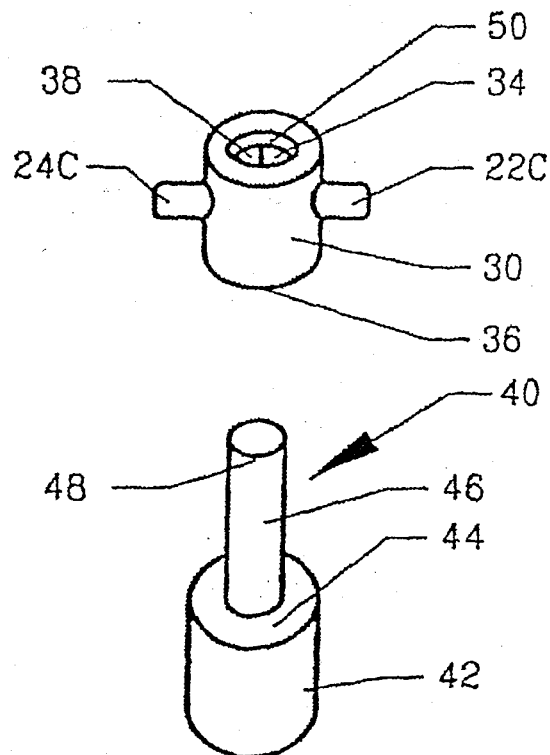
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : H01L 41/04	A1	(11) International Publication Number: WO 00/65668 (43) International Publication Date: 2 November 2000 (02.11.00)
(21) International Application Number: PCT/CN99/00061 (22) International Filing Date: 26 April 1999 (26.04.99) (71) Applicant (for all designated States except US): POLYCITY ENTERPRISE LIMITED [CN/CN]; Flat D, 19th Floor, Wah Ha Industrial Building, 8 Shipyard Lane, Quarry Bay, Hong Kong (CN). (72) Inventor; and (75) Inventor/Applicant (for US only): SHER, Tak, Chi [CN/CN]; Flat D, 19th Floor, Wah Ha Industrial Building, 8 Shipyard Lane, Quarry Bay, Hong Kong (CN). (74) Agent: SHANGHAI PATENT & TRADEMARK LAW OFFICE; 435 Guiping Road, Shanghai 200233 (CN).		(81) Designated States: AT, CN, DE, ES, GB, JP, KR, PL, US. Published With international search report.

(54) Title: IMPROVED HAMMER FOR A PIEZOELECTRIC ACTUATOR AND METHOD FOR PRODUCING SAME

(57) Abstract

An enhanced hammer for a piezoelectric actuator having integral arms extending horizontally from a ring body supported by a hammer body member. The hammer body member has a vertically extending elongated axle for centering the ring member. The ring member rests upon the base portion of the body member. The ring and base are molded as separate unitary pieces which are then fitted together to form the complete hammer assembly.



INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN 99/00061

A. CLASSIFICATION OF SUBJECT MATTER

H01L 41/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC⁶ H01L 41/04 41/02 41/08

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Chinese invention patent application and utility model from 1985 to

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Epodoc; hammer, arm, integral, impact mechanism

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4015152(Hans—Dieter Klauer) 29. Mar. 1997(29. 03. 77) figure 2, figure 5	1—8
A	US 3,967,142 David Easton Beach, pending, N. Y.) 29. June. 1976(29. 06. 76) abstract, Figure 1	1—8
A	US 3,984,738 (Walter Mohr) 05. Oct. 1976(15. 10. 76) Figure 1	1—8

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25. Nov. 1999(25. 11. 99)

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Facsimile No. 86-10-62019451

Telephone No. Zhang Yonglin



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International application No.
PCT/CN 99/00061

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4015152	29. 03. 77	none	
US 3967142	29. 06. 76	none	
US 3984738	05. 10. 76	none	

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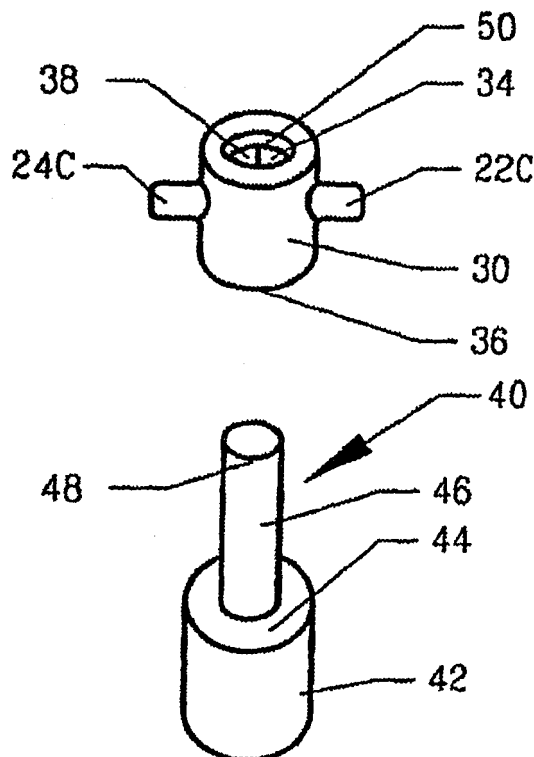
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An enhanced hammer for a piezoelectric actuator having integral arms extending horizontally from a ring body supported by a hammer body member. The hammer body member has a vertically extending elongated axle for centering the ring member. The ring member rests upon the base portion of the body member. The ring and base are molded as separate unitary pieces which are then fitted together to form the complete hammer assembly.



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IMPROVED HAMMER FOR A PIEZOELECTRIC ACTUATOR
AND METHOD FOR PRODUCING SAME

BACKGROUND OF THE INVENTION

The present invention relates to a unique hammer used in piezoelectric actuators. Specifically the present invention provides a hammer body with integral outwardly extending hammer arms and a method for producing the same.

Existing hammers as used in piezoelectric actuators are composed of two separate component parts--a hammer body and a hammer pin. To date there has not been a hammer in one unit, i.e., the hammer body and pin molded together, by die cast molding, nor has there been a hammer with a hole through the hammer body by die cast molding. The technical problems of molding such a small piece have not been overcome.

Presently, assembly of the hammer pin into the hammer body necessitates drilling a hole through the hammer body. The drilling of such a small hole through the hammer body which is also miniature in size is very difficult. For best performance of the hammer, the hammer pin must be fixed at the center point of the hammer body and in an absolutely balanced, horizontal and symmetric manner. This is very difficult to achieve for technical reasons during assembly of the hammer pin into the hammer body.

In the present invention, the hammer still consists of 2 parts. Yet, it is not necessary to drill a hole through the hammer body. Furthermore, the center point of the hammer body and the balance, horizontality and symmetricalness of the hammer arms is guaranteed in the

process of the present invention. The performance of the finished product using this newly invented hammer is therefore enhanced.

SUMMARY OF THE INVENTION

The present invention is a two-part hammer for a piezoelectric actuator wherein the horizontal hammer arms are integrally molded into the hammer ring member. A hammer body member having a vertically extending axle supports and retains the ring member by extending through a central opening in the ring.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 illustrates a cross-sectional view of a prior art hammer within a piezoelectric actuator.

Fig. 2A illustrates an exploded perspective view of a first prior art hammer.

Fig. 2B shows a side elevation view of the first prior art hammer of Fig. 2A.

Fig. 2C illustrates an exploded perspective view of a second prior art hammer.

Fig. 2D shows a side elevation view of the second prior art hammer of Fig. 2C.

Fig. 3A illustrates an exploded perspective view of the hammer of the present invention.

Fig. 3B shows a side elevation view of the hammer of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Fig. 1 illustrates in a cross-sectional view of a prior art hammer 11A within a piezoelectric actuator. The operation of such devices is well known in the art. The actuator operates by the collision of the hammer 11A with other parts of the actuator to generate an

electric charge. Any deviation in the balanced, symmetrical construction of the hammer 11A will affect the stability of the emission of the electric charge from the actuator.

Figs. 2A-2D also illustrate prior art hammers. Fig. 2A is an exploded view of the two-part hammer 11. It has a hammer body member 12 and a hammer pin 14. A hole 16 must be drilled through the body 12 to accept the pin 14. The drilling is done after the body has been molded. Pin end 18 is pressed into the hole 16 and must be exactly in the center of the body 12 to be absolutely balanced and horizontal with the extended arms 22 and 24 perfectly symmetrical.

Another prior art hammer 11A is shown in Figs. 2C and 2D. Again, pin 14A must be pressed into drilled hole 16A with the arms 22A and 24 perfectly symmetrical, balanced, and horizontal within the body 12A.

The present invention is shown in Figs. 3A and 3B. Hammer 11C has a guaranteed center point with perfect balance, horizontal arms, and symmetric arms because the arms 22C and 24C are formed by unitary molding. The arms are formed in the molding process and are, therefore, integral to the ring body 30. The hammer arms are not formed by a pin passing through a delicately drilled hole as is known in the prior art. Hammer ring body 30, made of metallic or non-metallic materials, such as plastic, is a generally cylindrical tube with a vertically extending, central opening 34 with perpendicularly extending arms 22C and 24C. By forming the arms in the mold improved symmetry and balance of the hammer is achieved.

The hammer 11C is assembled by placing ring 30 over hammer body member 40, which is made of metal. Hammer body member 40 has a cylindrical base portion 42 with



a shoulder 44. Extending upwardly from the center of the base portion 42 is an elongated cylindrical axle member 46. When assembled, the underside 36 of the ring 30 is pressed against the shoulder 44 of the body member 40.

The outer surface 48 of the elongated axle 46 may be fixed or fitted tightly against the inner surface 38 of the ring 30 by various means. Depending upon the composition of the ring 30, there may be a certain degree of elasticity of ring 30, the diameter of the inner hole 34, thus, may be slightly less than the diameter of the elongated axle 46 (the axle having a diameter the same as or slightly greater than the hole). Alternatively, the inner surface 38 may be provided with protruding vertical strips 50 which when the ring 30 is wholly squeezed onto the elongated axle 46 will fit tightly against the inner surface 38 and the strips 50 to hold the ring 30 on the body member 40. Thus, an improved hammer is produced.

Although the invention has been described with reference to a specific embodiment, this description is not meant to be construed in a limiting sense. On the contrary, various modifications of the disclosed embodiments will become apparent to those skilled in the art upon reference to the description of the invention. It is therefore contemplated that the appended claims will cover such modifications, alternatives, and equivalents that fall within the true spirit and scope of the invention.

CLAIMS:

1. A hammer for a piezoelectric actuator comprising:
 - a hammer ring member having two perpendicularly extending integral arms and a central opening; and
 - a hammer body having a base portion and an upwardly extending axle member, said axle member extending through said central opening of said hammer ring, said hammer ring member seated on said base portion of said hammer body.
2. The hammer of claim 1 wherein said axle member is generally cylindrical having a diameter slightly less than said central opening to ensure a tight fit between said axle member and said central opening.
3. The hammer of claim 1 wherein said central opening has protruding vertical strips for urging against an outer surface of said axle member to ensure a tight fit between said axle member and said central opening.
4. The hammer of claim 3 wherein said axle member is generally cylindrical.
5. The hammer of claim 1 wherein said ring member is made of molded plastic and said hammer body is made of metal.

6. The hammer of claim 5 wherein a diameter of said central opening of said hammer ring is same as or slightly less than a diameter of said axle member.
7. A method for producing a hammer for a piezoelectric actuator comprising the steps of:
molding a unitary hammer ring member having two perpendicularly extending
integral arms and a central vertical opening;
molding a hammer body having a base portion and an upwardly extending axle
member;
pressing said unitary ring onto said hammer body with said axle member extending
through said central opening and said ring seated on said base portion.
8. The method of claim 6 wherein said hammer ring member is made of plastic material
and said hammer body is made of metal materials.

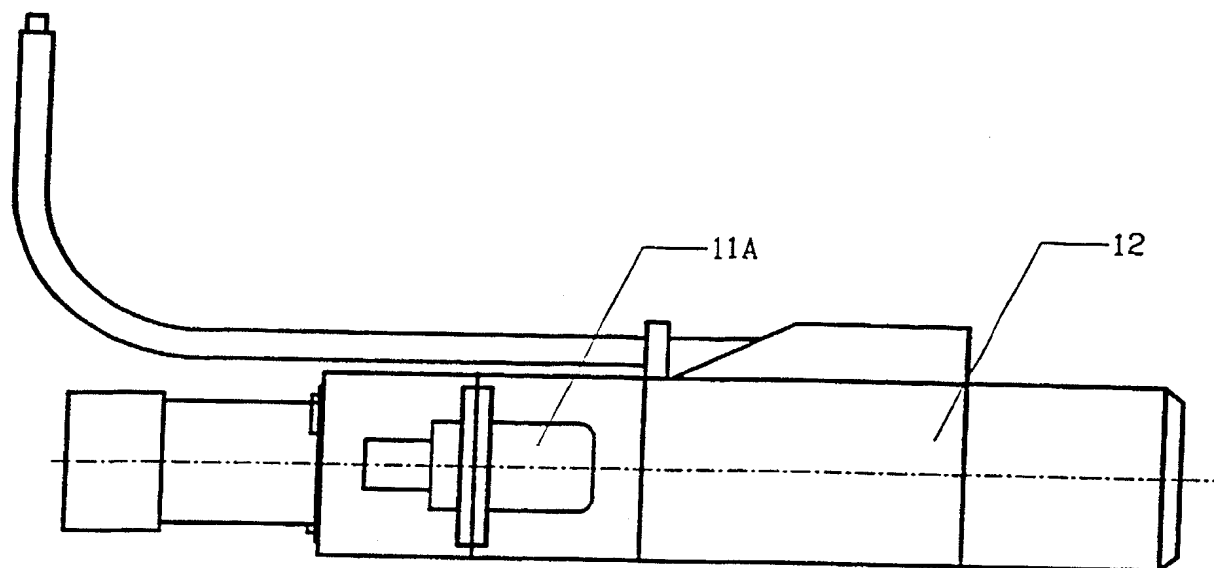


Fig. 1

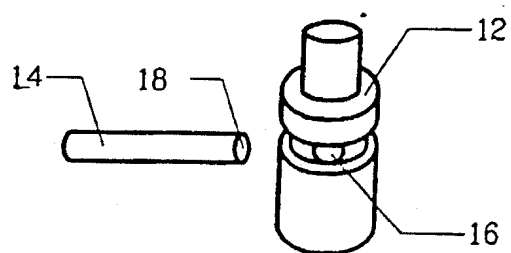


Fig. 2A

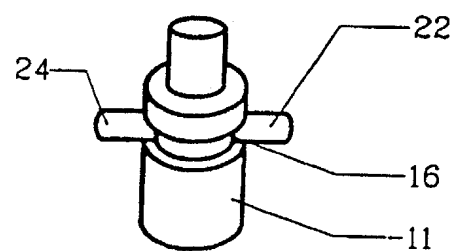


Fig. 2B

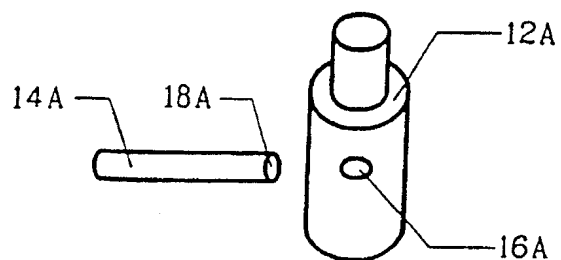


Fig. 2C

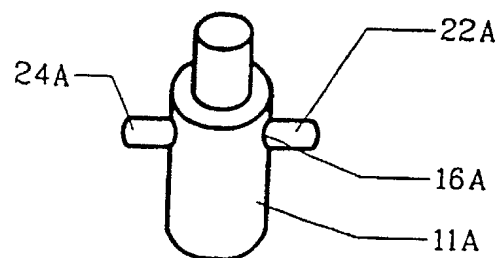


Fig. 2D

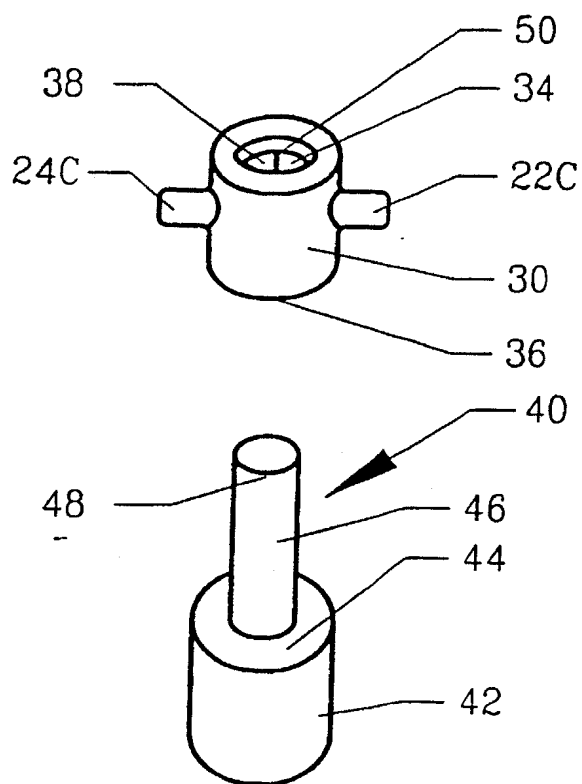


Fig. 3A

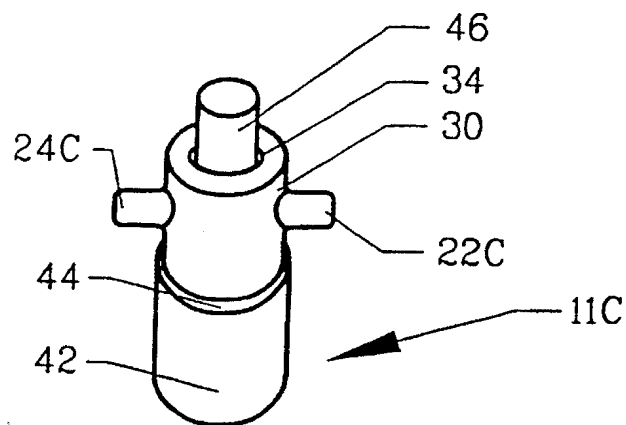


Fig. 3B

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN 99/00061

A. CLASSIFICATION OF SUBJECT MATTER

H01L 41/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC⁸ H01L 41/04 41/02 41/08

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Chinese invention patent application and utility model from 1985 to

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Epodoc; hammer, arm, integral, impact mechanism

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 4015152(Hans-Dieter Klauer) 29. Mar. 1997(29. 03. 77) figure 2, figure 5	1—8
A	US 3,967,142 David Easton Beach, penfiled, N. Y.) 29. June. 1976(29. 06. 76) abstract, Figure 1	1—8
A	US 3,984,738 (Walter Mohr) 05. Oct. 1976(15. 10. 76) Figure 1	1—8

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US 4015152

29. 03. 77

none

US 3967142

29. 06. 76

none

US 3984738

05. 10. 76

none